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9-207242	Japan	July 16, 1997

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Signed this 17 day of 2005, 2005

Tadashi Hirosawa
Full name of Translator

Tadashi Hirosawa
Signature of Translator

2-13-16 Inukura, Miyamae-ku, Kawasaki-shi, Kanagawa, Japan
Post Office Address

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【Title of the Invention】 OPTICAL DISC PLAYBACK APPARATUS

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【Inventor】

【Address or Abode】 c/o Victor Company of Japan, Ltd., 3-12, Moriya-cho, Kanagawa-ku, Yokohama-shi, Kanagawa-ken

【Name】 Yoshiaki TANAKA

【Inventor】

【Address or Abode】 c/o Victor Company of Japan, Ltd., 3-12, Moriya-cho, Kanagawa-ku, Yokohama-shi, Kanagawa-ken

【Name】 Norihiko FUCHIGAMI

【Inventor】

【Address or Abode】 c/o Victor Company of Japan, Ltd., 3-12, Moriya-cho, Kanagawa-ku, Yokohama-shi, Kanagawa-ken

【Name】 Shoji UENO

【Applicant】

【Identification Number】 000004329

【Name or Designation】 Victor Company of Japan, Ltd.

【Representative】 Takeo SHUZUI

【Agent】

【Identification Number】 100093067

【Patent Attorney】

【Name or Designation】 Masayuki NIHEI

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[DOCUMENT NAME] Specification

[TITLE OF THE INVENTION] Optical Disc Playback Apparatus

[CLAIMS]

[Claim 1] An optical disc playback apparatus for playing back an optical disc on which audio packs and control packs are recorded, the audio packs containing audio data resulting from A/D conversion of an analog audio signal of one channel or more, the control packs containing control data for playing back the previously-mentioned audio data, the apparatus comprising:

first and second input buffer means for alternately buffering audio packs taken out of the previously-mentioned optical disc;

control data decoding means for decoding control data from a control pack taken out of the previously-mentioned optical disc;

audio data decoding means for decoding audio data from the audio packs which are alternately buffered by the previously-mentioned first and second input buffer means on the basis of the control data decoded by the previously-mentioned control data decoding means; and

D/A converting means for converting the audio data decoded by the previously-mentioned audio data decoding means into an analog audio signal.

[Claim 2] The optical disc playback apparatus mentioned in claim 1, characterized in that each of the previously-mentioned first and second input buffer means has a capacity of 4 k bytes.

[DETAILED EXPLANATION OF THE INVENTION]

[0001]

[Field of the Invention]

This invention relates to an optical disc playback apparatus for playing back, for example, a DVD (digital video disc, a digital versatile disc) audio disc.

[0002]

[Prior Art]

Fig. 22 and Fig. 23 show the structure of a reference player disclosed in the documents of the standards of a DVD video disc. In Fig. 22, a signal taken out of a DVD video disc is subjected to EFM demodulation by a demodulation/ECC portion 1 and is then subjected to error correction, being transmitted via a track buffer 2 to a demultiplexer (DEMUX) 10 and being transmitted to a DSI (data search information) buffer 3 and a system buffer 4. The demultiplexer 10 separates data streams of video (V) packs, sub pictures (SP), audio (A) packs, and PCI (presentation control information) in navigation (Nv) packs from a stream signal transmitted from the track buffer 2. The DSI transmitted to the DSI buffer 3 is decoded by a DSI decoder 5 and a DSI decoder buffer 6.

[0003]

As shown in Fig. 23, this player has a video buffer 11, a sub picture buffer 21, an audio buffer 31, and a PCI buffer 41 as input buffers for buffering the respective data streams of the video packs, the sub pictures, the audio packs, and the PCI which are separated by the demultiplexer 10. The capacity of the video buffer 11 is 8 k bytes + 224 k bytes in the case of MPEG-2 video, and is 46 k bytes in the case of MPEG-1 video. The capacity of the sub picture buffer 21 is 52 k bytes. The capacity of the audio buffer 31 is 4 k bytes. The capacity of the PCI

buffer 41 is 980 × 3 bytes.

[0004]

A video processing stage has the above-mentioned video buffer 11, a video decoder 12, a video decoder buffer 13, a reorder buffer 14, a change portion 15, a letter box converter 16, and a combining device 17. A sub picture processing stage has the above-mentioned sub picture buffer 21, a sub picture decoder 22, and a sub picture decoder buffer 23, and a sub picture signal decoded by the sub picture decoder 22 is applied to the combining device 17. An audio processing stage has the above-mentioned audio buffer 31, an audio decoder 32, and an audio decoder buffer 33. A PCI processing stage has the above-mentioned PCI buffer 41, a PCI decoder 42, a PCI decoder buffer 43, an HLI (highlight information) buffer 44, an HLI decoder 45, and an HLI decoder buffer 46.

[0005]

According to the DVD video standards, an audio signal recorded on a DVD video disc can be of one channel (monaural), two channels (stereophonic), or multiple channels being 3 ~ 8 channels. The sampling frequency for each channel can be 48 kHz or 96 kHz. The quantization bit number can be 16, 20, or 24. The maximum rate of the processing of an audio signal by a DVD video player is set to 6.144 Mbps (= the sampling frequency × the quantization bit number × the channel number).

[0006]

In the DVD-video, since the recording is done while a video signal is set main while an audio signal is set sub, there are the following

problems.

(1) The audio signal is integral with the video signal, and a recording capacity for the audio signal is small.

(2) It is difficult to manage time for the audio signal.

(3) It is difficult to take out simple character information such as a tune name.

[0007]

Users of audio are wider in layer of methods of use than video, and an area of TOC (table of contents) is provided as in a CD and thereby an easy playback method is desired. However, in the DVD-video, since a navigation control pack (a CONT pack), plural video (V) packs, and audio (A) packs compose a video contents block unit, and the reproduction of the V and A packs is controlled by the CONT pack, there is the following problem. If an audio signal is intended to be mainly recorded, it is difficult for a user to implement playback. Thus, it is inconvenient in use.

[0008]

Furthermore, in the DVD-video, since the time management is implemented only in video frame units, there is the following problem. If an audio signal is intended to be mainly recorded, the continuity of the audio signal is more important than video and hence it is difficult to manage real time.

[0009]

A conceivable DVD audio disc can be easily played back by a user if an audio signal is mainly recorded, and it is convenient in use. In order to facilitate the management of real time, the conceivable DVD audio

disc is provided with a control pack containing information for managing audio data with respect to packs containing the audio data. According to such a DVD audio disc, a DVD is an optical disc having a high density. Thus, an audio signal having a long time can be recorded at a high sampling frequency and a high quantization bit number.

[0010]

[Problems to be Solved by the Invention]

However, the maximum rate of the processing of an audio signal by a DVD audio player is set to 6.144 Mpbs. Therefore, if the recording is done at a greater channel number, a higher sampling frequency, and a greater quantization bit number than those in the DVD video standards, there occurs a problem that the DVD video player can not process the audio signal. Specifically, for example, if the sampling frequency is made high, the quantization bit number can not be made great. On the other hand, if the quantization bit number is made great, the sampling frequency can not be made high.

[0011]

Fig. 20 show transmission rates (processing rates Mbps) which occur in the case where only stereophonic two channels (multiple channels are absent), stereophonic two channels + six channels, stereophonic two channels + eight channels, only six channels (stereophonic two channels are absent), and only eight channels (stereophonic two channels are absent) are subjected to A/D conversion at sampling frequencies fs = 48 kHz, 96 kHz, and 192 kHz, and quantization bit numbers = 16, 20, and 24. In the case of only stereophonic two channels, the processing rate is less than 6.144 Mpbs

at a quantization bit number = 24 provided that fs = 48 kHz or 96 kHz, and hence the processing is possible. When fs = 192 kHz, the processing rate is 6.144 Mpbs even if a quantization bit number = 16. In the case of only eight channels, the processing rate is 6.144 Mpbs even if a quantization bit number = 16 and fs = 48 kHz. Accordingly, signals denoted by the × marks can not be processed by a DVD video player such as shown in Fig. 22 and Fig. 23.

[0012]

In view of the above-mentioned problems, an object of this invention is to provide an optical disc playback apparatus which can implement processing even in cases where an audio signal is recorded at a greater channel number, a higher sampling frequency, and a greater quantization bit number than those in the DVD video standards.

[0013]

[Means for Solving the Problems]

In order to attain the above-mentioned object, this invention is designed so that audio packs taken out of an optical disc will be alternately buffered by first and second input buffers.

This invention provides an optical disc playback apparatus for playing back an optical disc on which audio packs and control packs are recorded, the audio packs containing audio data resulting from A/D conversion of an analog audio signal of one channel or more, the control packs containing control data for playing back the previously-mentioned audio data, the apparatus comprising:

first and second input buffer means for alternately buffering audio packs taken out of the previously-mentioned optical disc;

control data decoding means for decoding control data from a control pack taken out of the previously-mentioned optical disc;

audio data decoding means for decoding audio data from the audio packs which are alternately buffered by the previously-mentioned first and second input buffer means on the basis of the control data decoded by the previously-mentioned control data decoding means; and

D/A converting means for converting the audio data decoded by the previously-mentioned audio data decoding means into an analog audio signal.

[0014]

[Embodiments of the Invention]

Embodiments of this invention will be explained below with reference to drawings. Fig. 1 is an explanation view showing one embodiment of the format of a DVD-video and the format of a DVD-audio related to this invention. Fig. 2 is an explanation view which shows, in detail, the format of an audio manager (AMG) in Fig. 1. Fig. 3 is an explanation view which shows, in detail, the format of an audio album set (AAS) in Fig. 1. Fig. 4 is an explanation view which shows, in detail, the format of an audio manager information (AMGI) in Fig. 2. Fig. 5 is an explanation view which shows, in detail, the format of an audio album set attribute table (AAS-ATRT) in Fig. 4. Fig. 6 is an explanation view which shows, in detail, the format of audio album set attribute data (AAS-ATR) in Fig. 5. Fig. 7 is an explanation view which shows, in detail, the format of audio album set information (AASI) in Fig. 3. Fig. 8 is an explanation view which shows, in detail, the format of an audio album set information management table (AASI-MAT) in Fig. 7. Fig. 9 is

an explanation view which shows, in detail, audio album set menu audio stream attribute data (AASM-AST-ATR) in Fig. 8. Fig. 10 is an explanation view which shows, in detail, the format of an audio album set audio stream attribute table (AAS-AST-ATRT) in Fig. 8. Fig. 11 is an explanation view which shows, in detail, attribute data (AAS-AST-ATR) of each audio stream in Fig. 10.

Fig. 12 is an explanation view which shows an audio contents block unit (ACBU) in Fig. 1. Fig. 13 is an explanation view which shows, in detail, the format of a video pack and an audio pack in Fig. 12. Fig. 14 is an explanation view which shows, in detail, the format of an audio control (A-CONT) pack in Fig. 12. Fig. 15 is an explanation view which shows, in detail, the format of an audio character display (ACD) area in Fig. 12. Fig. 16 is an explanation view which shows an example displayed by name space information in Fig. 15. Fig. 17 is an explanation view which shows, in detail, the format of an audio search data (ASD) area in Fig. 14. Fig. 18 is an explanation view showing a modified example of an audio contents block unit in Fig. 12.

Fig. 19 is a block diagram showing a main portion of an embodiment of an optical disc playback apparatus related to this invention. Fig. 20 is an explanation view which indicates a processing rate depending on the channel number, the sampling frequency, and the quantization bit number. Fig. 21 is an explanation view which shows another example of a processing rate depending on the channel number, the sampling frequency, and the quantization bit number.

[0015]

Here, both a signal of stereophonic two channels and a signal of

multiple channels being 5/6/8 channels are recorded on a DVD-audio disc, which is explained, as audio signals in correspondence with a period of transition from a CD generation to a DVD-audio generation. It is thought that after the period of transition, only a signal of multiple channels being 5/6/8 channels will be recorded.

[0016]

Figs. 1(a) and (b) show the formats of a DVD-video and a DVD-audio respectively. Although the format of a DVD-audio has different area names, compatibility with a DVD-video is provided. Firstly, the format of a DVD-video is roughly formed by areas of a video manager (VMG) at a head, and a plurality of video title sets (VTS) following it. In correspondence therewith, the format of a DVD-audio is formed by areas of an audio manager (AMG) which is shown in detail in Fig. 2, and a plurality of audio album sets (AAS) following the AMG as shown in detail in Fig. 3.

[0017]

Each of the VTS is composed of VTS information (VTSI) at a head, one or more video contents block sets (VCBS) following it, and VTSI at an end. In correspondence therewith, each of the AAS is composed of AAS information (AASI) at a head, one or more audio contents block sets (ACBS) following it, and AASI at an end. The playing times of respective tunes in the ACBS are set in the AASI in real time.

[0018]

Each of the VCBS is composed of a plurality of VCB. On the other hand, each of the ACBS is composed of a plurality of ACB. Each of the VCB corresponds to one title (Title) of video. In correspondence

therewith, each of the ACB corresponds one album (Album) of audio. Each (one title) of the VCB is composed of a plurality of chapters (Chapter). On the other hand, in correspondence therewith, each (one title) of the ACB is composed of a plurality of tracks (Track). The chapter contains a part of title (PTT). The track contains a part of album (PTA).

[0019]

Each of the chapters is composed of a plurality of cells (CELL). On the other hand, in correspondence therewith, each of the tracks is composed of a plurality of indexes (Index). Each of the cells is composed of a plurality of VCB units (VCBU). On the other hand, in correspondence therewith, each of the indexes is composed of a plurality of ACB units (ACBU). Each of the VCB units and the ACB units is composed of a plurality of packs. One pack has 2048 bytes.

[0020]

Each of the VCB units is composed of a control pack (referred to as a CONT pack hereinafter) at a head, a plurality of video (V) packs, audio (A) packs, and sub picture (SP) packs following it. On the other hand, in correspondence therewith, each of the ACB units is composed of an audio control pack (referred to as an A-CONT pack hereinafter) at a head, and a plurality of A packs and V packs following it.

[0021]

A CONT pack is loaded with information for controlling later V packs. An A-CONT pack is loaded with information for managing an audio signal of later A packs as TOC information of a CD. An A pack is loaded with audio data. A V pack is loaded with video data and also, for

example, closed caption (CC) data other than audio data.

[0022]

As shown in Fig. 2, the AMG (audio manager) has audio manager information (AMGI) which is shown in detail in Fig. 4, an audio contents block sets (AMGM-ACBS) for an AMG menu, and AMGI for back-up. The AMGM-ACBS has presentation control information (PCI) and data search information (DSI) as control information.

[0023]

As shown in Fig. 3, the AAS (audio album set) has audio album set information (AASI) which is shown in detail in Fig. 7, an audio contents block set (AASM-ACBS) for an AAS menu, an audio contents block set (AASA-ACBS) for an AAS album, and AASI for back-up. Each of the AASM-ACBS and the AASA-ACBS has PCI and DSI which are previously mentioned (Fig. 2).

[0024]

As shown in detail in Fig. 4, the AMGI (audio manager information) has an AMGI management table (AMGI-MAT), an album search pointer table (A-SRPT), an audio manager menu PGCI unit table (AMGM-PGCI-UT), a parental management information table (PTL-MAIT), an audio album set attribute table (AAS-ATRT) in detail in Fig. 5, a text manager (TXTDT-MG), an audio manager menu cell (index) address table (AMGM-C-ADT), and an audio manager menu audio contents block unit address map (AMGM-ACBU-ADMAP).

[0025]

As shown in detail in Fig. 5, the AAS-ATRT (audio album set attribute table) has audio album set attribute table information (AAS-

ATRTI), audio album set attribute search pointers (AAS-ATR-SRP#1 ~ #n) of respective plural (n) AAS, and audio album set attribute data (AAS-ATR-#1 ~ #n) of respective plural (n) AAS such as shown in detail in Fig. 6.

[0026]

As shown in detail in Fig. 6, each of the audio album set attribute data (AAS-ATR-#1 ~ #n) has AAS-ATR-EA (end address), AAS-CAT (category), and AAS-ATRI (information).

[0027]

As shown in detail in Fig. 7, the AASI (AAS information) shown in Fig. 3 has an audio album set information management table (AASI-MAT) shown in detail in Fig. 8, an audio album set part of album search pointer table (AAS-PTA-SRPT), an audio album set program chain information table (AAS-PGCIT), an audio album set menu PGCI unit table (AASM-PGCI-UT), an audio album set time map table (AAS-TMAPT), an audio album set menu cell address table (AASM-C-ADT), an audio album set menu audio contents object unit address map (AASM-ACBU-ADMAP), an audio album set cell address table (AAS-C-ADT), and an audio album set audio contents object unit address map (AAS-ACBU-ADMAP).

[0028]

As shown in detail in Fig. 8, the AASI-MAT (audio album set information management table) shown in Fig. 7 has AAS-ID (identifier), AAS-EA (end address), AASI-EA, VERN (DVD audio specification version number), AAS-CAT (category), AASI-MAT-EA, AASM-ACBS-SA (start address), AASA-ACBS-SA, AAS-PTA-SRPT-SA, AAS-PGCIT-SA, AASM-

PGCI-UT-SA, AAS-TMAP-SA, AASM-C-ADT-SA, AASM-ACBU-ADMAP-SA, AASM-AST-ATR (AASM audio stream attribute) such as shown in detail in Fig. 9, AAS-AST-Ns (AAS audio stream number), and AAS-AST-ATRT (AAS audio stream attribute table) such as shown in detail in Fig. 10.

[0029]

As shown in detail in Fig. 9, the AASM-AST-ATR has 8 bytes (bits b63 ~ b0), and is loaded with the following data (1) ~ (4) as an attribute of a coded audio signal recorded on the present disc (other bits are reserved).

(1) Audio encoding mode (3 bits b63 ~ b61)

000b: Dolby AC-3

010b: MPEG-1 or MPEG-2 (absence of an extended bit stream)

011b: MPEG-2 (presence of an extended bit stream)

100b: linear PCM audio

101b: linear PCM audio (containing 2 ch + 5 ch, 2 ch + 6 ch, 2 ch + 8 ch)

[0030]

(2) Quantization/DRC (dynamic range control) information (2 bits b55 and b54)

In the case where the audio encoding mode is "000b", "11b";

In the case where the audio encoding mode is "010b" or "011b":

00b: dynamic range control data is absent from the MPEG audio stream;

01b: dynamic range control data is present in the MEG audio stream;

10b, 11b: reserved;

In the case where the audio encoding mode is "100b" or "101b", with respect to stereophonic 2 channels:

00b: 16 bits

01b: 20 bits

10b: 24 bits

11b: reserved

[0031]

(3) Sampling frequency fs (2 bits b53 and b52)

With respect to stereophonic 2 channels:

00b: 48 kHz

01b: 96 kHz

10b: 192 kHz

(4) Audio channel number (3 bits b50 ~ b48)

000b: 1 ch (monaural)

001b: 2 ch (stereophonic)

010b: 3 ch

011b: 4 ch

100b: (stereophonic 2 ch + 5 ch)

101b: (stereophonic 2 ch + 6 ch)

110b: 7 ch

111b: (stereophonic 2 ch + 8 ch)

[0032]

As shown in detail in Fig. 11, the AAS-AST-ATRT (AAS audio stream attribute table) shown in Fig. 10 has AAS-AST-ATR for each of the audio streams #0 ~ #7. Each of the AAS-AST-ATR has 8 bytes (64 bytes in total).

[0033]

As shown in Fig. 11, the AAS-AST-ATR for one audio stream has 8

bytes (bit b63 ~ b0) similarly to the audio album set menu audio stream attribute data (AASM-AST-ATR) shown in Fig. 9. In addition to the above-mentioned attribute data (1) ~ (4), it has:

(5) a multi-channel extension (ME) (1 bit b60);

(6) an audio type (2 bits b59 and b58);

(7) an audio application mode (2 bits b57 and b56);

(8) stream (AST) thinning information (2 bits b47 and b46); and

(9) thinning information (2 bits b45 and b44) for only a low frequency effect channel (LFE). On the (7) audio application mode of the present DVD audio disc, 11b: 2 ch + surround mode is recorded. In addition, on both the (8) stream thinning information and the (9) LEF 1 ch thinning information, as band information, the following is recorded.

00b: full (1/1)

01b: half (1/2)

10b: quarter (1/4)

[0034]

The (4) audio channel number in the AASM-AST-ATR is always 2 ch in the case of the audio stream #0. The audio stream #1 contains front 3 channels. Specifically, for example, in the case where an audio signal of one album is recorded with 2 + 6 ch, 2 ch stereophonic signals are assigned to the audio stream #0, and front signals of 3 ch among 6 ch are assigned to the audio stream #1, and rear signals of 2 ch and an LFE 1 ch signal are assigned to the audio stream #2. On both the audio manager information management table (AMGI-MAT) shown in Fig. 4 and the audio album set information management table (AASI-MAT) shown in Fig. 7, "3" is recorded as use data of the streams #0 ~ #2.

[0035]

For example, the 2 + 6 ch analog audio signal is sampled at the following sampling frequency fs, and is quantized with the following quantization bit number before being recorded:

stereophonic 2 ch: 48 kHz, 20 bits

front 3 ch: 96 kHz, 16 bits

rear 2 ch, LFE 1 ch: 48 kHz, 16 bits (absence of thinning). In this case, on the audio album set menu audio stream attribute data (AASM-AST-ATR) shown in Fig. 9, as an attribute of stereophonic 2 ch, the following are recorded:

(1) audio encoding mode

101b: linear PCM audio (containing 2 ch + 5 ch, 2 ch + 6 ch, 2 ch + 8 ch);

(2) quantization/DRC

01b: 20 bits;

(3) sampling frequency fs

00b: 48 kHz;

(4) audio channel number

101b: (stereophonic 2 ch + 6 ch).

[0036]

On the AAS-AST-ATR of the audio stream #0, the following are recorded:

(1) audio encoding mode

101b: linear PCM audio (containing 2 ch + 5 ch, 2 ch + 6 ch, 2 ch + 8 ch);

(2) quantization/DRC

01b: 20 bits;

(3) sampling frequency fs

00b: 48 kHz;

(4) audio channel number

001b: 2 ch (stereophonic);

(7) audio application mode

11b: 2 ch + surround mode;

(8) thinning information of the stream

00b: full (1/1); and

(9) LFE 1 ch thinning information

00b: full (1/1).

[0037]

On the AAS-AST-ATR of the audio stream #1, the following are recorded:

(1) audio encoding mode

101b: linear PCM audio (containing 2 ch + 5 ch, 2 ch + 6 ch, 2 ch + 8 ch);

(2) quantization/DRC

00b: 16 bits;

(3) sampling frequency fs

01b: 96 kHz;

(4) audio channel number

010b: 3 ch;

(7) audio application mode

11b: 2 ch + surround mode;

(8) thinning information of the stream

00b: full (1/1); and

(9) LFE 1 ch thinning information

00b: full (1/1).

[0038]

On the AAS-AST-ATR of the audio stream #2, the following are recorded:

(1) audio encoding mode

101b: linear PCM audio (containing 2 ch + 5 ch, 2 ch + 6 ch, 2 ch + 8 ch);

(2) quantization/DRC

00b: 16 bits;

(3) sampling frequency fs

00b: 48 kHz;

(4) audio channel number

010b: 3 ch;

(7) audio application mode

11b: 2 ch + surround mode;

(8) thinning information of the stream

00b: full (1/1); and

(9) LFE 1 ch thinning information

00b: full (1/1).

[0039]

Next, an explanation will be given of an A pack on which an audio stream is recorded, and a control pack therefor. As shown in Fig. 12, a VCB unit is composed of an arbitrary number of packs corresponding to 0.4 ~ 1.0 second. An ACB unit is composed of an arbitrary number of

packs corresponding to 0.5 ~ 1.0 second. An A-CONT pack in an ACB unit of a DVD-audio is placed in a third pack in a VCB unit of a DVD-video.

[0040]

Basically, A-CONT packs are placed in units of 0.5 second in audio time, and are placed so that they are complete in a range of 0.5 ~ 1.0 second at the region between indexes. Audio time (GOF: Group of Audio Frame unit) is denoted by an A-CONT pack, and its data position is determined by the audio frame number, the first access unit pointer, and the frame header number. It is not mandatory that an A pack immediately preceding an A-CONT pack is padded in units of 0.5 second in audio time.

[0041]

Neighboring A packs are arranged so that audio signals will relate to each other. For example, in the case of stereophony, an L channel pack and an R channel pack are arranged to be adjacent to each other. In the case of multiple channels being 5/6/8 channels, there are arranged to be adjacent to each other. In the case where an image is displayed during playback, a V pack is placed to be adjacent to an A pack thereof. As shown in Fig. 13, an A pack and a V pack are designed so that pack headers of 14 bytes in total which are pack start information of 4 bytes, SCR (System Clock Reference: system clock reference value) information of 6 bytes, Mux rate information of 3 bytes, and stuffing of 1 byte are added to user data (A data, V data) of 2034 bytes (1 pack = 2048 bytes in total). In this case, the SCR information being a time stamp is set to "1" in a head pack within an ACB unit, and

is made continuous in a same album, and thereby time of an A pack in the same album can be managed.

[0042]

On the other hand, as shown in Fig. 14, an A-CONT pack is composed of a pack header of 14 bytes, a system header of 24 bytes, an ACD (audio character display) packet of 1003 bytes, and an ASD (audio search data) packet of 1007 bytes. The ACD packet is composed of a packet header of 6 bytes, sub stream ID of 1 byte, ACD (audio character display) information of 636 bytes such as shown in detail in Fig. 15, and a reserved area of 360 bytes. Similarly, the ASD packet is composed of a packet header of 6 bytes, sub stream ID of 1 byte, and ASD (audio search data) of 1000 bytes such as shown in detail in Fig. 17.

[0043]

As shown in detail in Fig. 15, the ACD information area of 636 bytes is composed of a general information area of 48 bytes, a name space area of 93 bytes, two free space areas each of 93 bytes, a data pointer area of 15 bytes, and an audio playback control information area of 294 bytes. For example, data for indicating a tune name such as shown in Fig. 16 is placed in the name space area.

[0044]

The general information of 48 bytes is composed of, for example, service level information of 16 bytes, language code information of 12 bytes, character set code information of 6 bytes, display item information of 6 bytes, 2-byte information of difference from previous ACD information, and reserved information of 6 bytes. The service level information of 16 bytes represents a display size, a type of indication, a

discrimination among audio/video/SP, a stream, and others. Characters are mandatory. A bit map is optional. The character set code information of 6 bytes is designed so that similarly to a video file, each of languages of the characters "1" and "2" is denoted by 2 bytes. It denotes 8 languages at most in one file. English is mandatory.

[0045]

The character set code information of 6 bytes can have 15 character codes at most which correspond to language codes, and is designed so that 1 byte represents the presence or absence of the languages of the characters "1" and "2", and the type thereof. Code examples are shown below.

1. ISO646
2. ISO8859-1
3. MS-JIS

The display item information of 6 bytes represents free spaces "1" and "2" which are shown in Fig. 15, the presence and absence of a data pointer, and ID. The name space is mandatory. The album name, the music name, and the artist name are always written.

[0046]

The contents of the audio playback control information area of 294 bytes are arbitrary, and it is composed of, for example, audio playback control information areas (250 bytes) for 10 types each of 25 bytes, and a reserved area of 44 bytes. Graphic equalizer information of 20 bytes, level balance information of 3 bytes, and reverberation adding information of 2 bytes are placed in the audio playback control information for one type. The information is selected by a user, and the

tone quality of an audio signal is controlled. The audio playback control information is data recommended by a professional mixer such that in the case where the user plays back a tune placed in A packs, the tone quality during the playback will be optimized depending on the type (classic, jazz, rock, and BGM) of the tune, and depending on the environments, the record conditions, and the playing conditions of the tune even in the same type.

[0047]

As shown in detail in Fig. 17, the ASD (audio search data) of 1000 bytes is composed of general information of 16 bytes, current number information of 8 bytes, present time information of 16 bytes, album set search information of 8 bytes, album search information of 8 bytes, track search information of 404 bytes, index search information of 408 bytes, highlight search information of 80 bytes, and a reserved area of 52 bytes.

[0048]

The current number information of 8 bytes is composed of a present album number (2 bytes: BCD) of the album set, a present track number (2 bytes: BCD) of the album set, a present index number (2 bytes: BCD) of the track, and a reserved area (2 bytes). The present time information of 16 bytes is composed of playback time (4 bytes: BCD) of the track, remaining playback time (4 bytes: BCD) of the track, absolute time (4 bytes: BCD) of the album, and remaining absolute time (4 bytes: BCD) of the album.

[0049]

The album set search information of 8 bytes is composed of a first

sector number (4 bytes) of the album set, and a last sector number (4 bytes) of the album set. The album search information of 8 bytes is composed of a first sector number (4 bytes) of the album, and a last sector number (4 bytes) of the album. The track search information of 404 bytes is composed of track and sector numbers (4 bytes × 99) of the album, a first track number (4 bytes) of the album, and a last track number (4 bytes) of the album.

[0050]

The index search information of 408 bytes is composed of index and sector numbers (4 bytes × 100) of the track, a first index number (4 bytes) of the track, and a last index number (4 bytes) of the track. The highlight search information of 80 bytes is composed of an in-sector number (4 bytes × 10) of the track, and an out-sector number (4 bytes × 10) of the track.

[0051]

According to such a format, an A-CONT pack for managing an audio signal of following A packs as TOC information of a CD is placed at a head of a plurality of A packs. Thus, the audio data is not integral with the video data, and the recording capacity can be great. In addition, audio time can be managed by the A-CONT pack. Furthermore, simple character information such as a tune name related to the audio data can be extracted by the A-CONT pack.

[0052]

The TOC information of a title, a start address, a playing time, and others is located in the A-CONT pack. Even in audio playback, it is possible that information according to operation by a user is taken out of

the A-CONT pack, and playback is started. The TOC information is placed in the audio manager information (AMGI) and the audio album set information (AASI), and thereby the necessary TOC information is stored in a memory within a player so that information according to operation by the user can be immediately read out from the memory and playback can be started. Since it is unnecessary to memorize information of a great capacity such as program chain information (PGCI) in a DVD-video, the disc can be efficiently managed.

[0053]

Furthermore:

1. In the case where video (V) data is absent from the contents;

(1) search and random access with respect to three layers being an album, a tune, and an index are made possible;

(2) random access, time search, and head finding in GOF (audio frame) unit are made possible; and

(3) time of an album, a tune, and an index can be managed in real time.

[0054]

2. In the case where video (V) data is present in the contents;

with respect to audio data, in addition to the above-mentioned (1) ~ (3);

(4) present time and remaining time in an album and a tune can be indicated and managed in real time.

With respect to video data;

(1) search and random access with respect to three layers being a title, a PTT, and a cell are made possible;

(2) random access, time search, and head finding in video frame unit are made possible;

(3) time of a title, a PTT, and a cell can be managed in real time; and (4) present time and remaining time in a PTT or a title can be indicated and managed in video frame unit time.

[0055]

The ACBU of Fig. 1(b) contains an A-CONT pack and a CONT pack not shown. As shown in Fig. 18, it may be designed so that it will not contain any V pack and CONT pack. In this case, although a video signal is not recorded, there is a feature that the recording capacity for an audio signal is increased. Thus, it is possible to reduce the disc size. In addition, a playback function can be simplified. Therefore, it is possible to provide a thing suited for a portable playback apparatus.

[0056]

Next, an embodiment of an optical disc playback apparatus related to this invention will be explained with reference to Fig. 19. Fig. 19 shows an example being an apparatus for playing pack a DVD audio disc loaded with ACBU which does not contain any V packs and any SP packs, and which contains A packs, A-CONT packs, and CONT packs. As an example, it shows an apparatus for playing back a disc in which front 3 channels are sampled at fs = 96 kHz, and rear 2 channels and an LFE 1 channel are sampled at fs = 48 kHz.

[0057]

A demultiplexer (DEMUX) 10 separates a disc reproduced signal from a track buffer 2 shown in Fig. 23 into A packs, A-CONT packs, and PCI contained in CONT packs. This apparatus has audio buffers 31-1 and 31-2, an A-CONT buffer 51, and a PCI buffer 41 as input buffers for buffering the A packs, the A-CONT packs, and the PCI respectively. The

capacity of each of the audio buffers 31-1 and 31-2 is 4 k bytes, and A packs of this capacity are alternately inputted.

[0058]

An audio decoder 32 and an audio decoder buffer 33 decode an audio stream signal (= user data) in the A packs alternately buffered by the audio buffers 31-1 and 31-2 into audio PCM signals of front 3 channels with fs = 96 kHz, and rear 2 channels and LFE 1 channel with fs = 48 kHz on the basis of information in the A-CONT pack decoded by an A-CONT decoder 52. The audio PCM signals of the front 3 channels are converted into analog signals by a D/A converter 34-1, and the audio PCM signals of the rear 2 channels and the LFE 1 channel are converted into analog signals by a D/A converter 34-2.

[0059]

This playback apparatus has the above-mentioned A-CONT buffer 51, the A-CONT decoder 52, an A-CONT decoder buffer 53, an audio HLI buffer 54, an audio HLI decoder 55, and an audio HLI decoder buffer 56 as a system for processing the A-CONT pack. It has the above-mentioned PCI buffer 41, a PCI decoder 42, a PCI decoder buffer 43, an HLI (highlight information) buffer 44, an HLI decoder 45, and an HLI decoder buffer 46 as a system for processing the PCI.

[0060]

According to such a design, since the audio buffers 31-1 and 31-2 each having a capacity of 4 k bytes are provided, the processing can be implemented at a rate of 9.8 Mbps. Even in the case where an audio signal subjected to A/D conversion at the channel number, the sampling frequency, and the quantization bit number which are denoted by the ×

marks such as shown in Fig. 20 is recorded on a disc, it can be processed and can be played back.

[0061]

Fig. 21 shows the processing rates which occur in the case where 2 ch + 6 ch are present, and the 6 channels are front 3 channels, rear 2 channels, and LFE 1 channel, in the case where 2 ch + 5 ch are present, and the 5 channels are front 3 channels and rear 2 channels, and in the case where only 6 ch are present, and the 6 channels are front 3 channels, rear 2 channels, and LFE 1 channel. Even in the case where the recording on a disc is implemented in such a way, it can be processed and can be played back. Even in the case where the sampling frequency fs and the quantization bit number are selected for each of the channels and the sampling frequencies fs of the respective channels are made in common, about 1 hour can be recorded on one disc provided that only the band of the LFE 1 channel is narrowed to implement compression and the recording is done. In the case where it is recorded while being compressed, a player side implements expansion and interpolation on the basis of thinned data of rear 2 ch + LFE 1 ch or only LFE 1 ch and then D/A conversion can be carried out at an original sampling frequency fs.

[0062]

Fig. 22 shows a playback apparatus for a DVD video disc as a second embodiment, and corresponds to Fig. 23. The same structural members as those in the prior-art example shown in Fig. 23 are denoted by the same reference characters, and a detailed explanation thereof will be omitted. This playback apparatus is designed so that in

the case where the capacity of the video buffer 11 has a surplus, A packs will be alternately buffered by the video buffer 11 and an audio buffer 31 of one system. According to such a design, even if an audio signal of up to 9.6 Mpbs is recorded on a DVD disc, it can be processed and can be played back.

Regarding the explanation of the embodiment of the above-mentioned digital audio signal of multiple channels, it is of linear PCM. It is not limited to this. The audio encoding mode may be Dolby AC-3, MPEG-1, or MPEG-2. In these cases, the sampling frequency and the quantization bit number are set to the standard values for channels other than front channels, and the sampling frequency fs and the quantization/DRC information in the AASM-AST-ATR (Fig. 9) are adopted for the front channels. Thus, different sampling frequencies and different quantization bit numbers can be selected. Thereby, it is possible to provide an optical disc playback apparatus which correspond to uses in a wide width.

[0063]

[Advantage of the Invention]

As explained above, in this invention, the audio packs taken out of the optical disc are alternately buffered by the first and second input buffers. Thus, even in the case where an audio signal is recorded with a greater channel number, a higher sampling frequency, and a greater quantization bit number than those in the DVD video standards, it can be processed.

[BRIEF EXPLANATION OF THE DRAWINGS]

[Fig. 1]

It is an explanation view showing one embodiment of the format of a DVD-video and the format of a DVD-audio related to this invention.

[Fig. 2]

It is an explanation view which shows, in detail, the format of an audio manager (AMG) in Fig. 1.

[Fig. 3]

It is an explanation view which shows, in detail, the format of an audio album set (AAS) in Fig. 1.

[Fig. 4]

It is an explanation view which shows, in detail, the format of an audio manager information (AMGI) in Fig. 2.

[Fig. 5]

It is an explanation view which shows, in detail, the format of an audio album set attribute table (AAS-ATRT) in Fig. 4.

[Fig. 6]

It is an explanation view which shows, in detail, the format of audio album set attribute data (AAS-ATR) in Fig. 5.

[Fig. 7]

It is an explanation view which shows, in detail, the format of audio album set information (AASI) in Fig. 3.

[Fig. 8]

It is an explanation view which shows, in detail, the format of an audio album set information management table (AASI-MAT) in Fig. 7.

[Fig. 9]

It is an explanation view which shows, in detail, audio album set menu audio stream attribute data (AASM-AST-ATR) in Fig. 8.

[Fig. 10]

It is an explanation view which shows, in detail, the format of an audio album set audio stream attribute table (AAS-AST-ATRT) in Fig. 8.

[Fig. 11]

It is an explanation view which shows, in detail, attribute data (AAS-AST-ATR) of each audio stream in Fig. 10.

[Fig. 12]

It is an explanation view which shows an audio contents block unit (ACBU) in Fig. 1.

[Fig. 13]

It is an explanation view which shows, in detail, the format of a video pack and an audio pack in Fig. 12.

[Fig. 14]

It is an explanation view which shows, in detail, the format of an audio control (A-CONT) pack in Fig. 12.

[Fig. 15]

It is an explanation view which shows, in detail, the format of an audio character display (ACD) area in Fig. 12.

[Fig. 16]

It is an explanation view which shows an example displayed by name space information in Fig. 15.

[Fig. 17]

It is an explanation view which shows, in detail, the format of an audio search data (ASD) area in Fig. 14.

[Fig. 18]

It is an explanation view showing a modified example of an audio

contents block unit in Fig. 12.

[Fig. 19]

It is a block diagram showing a main portion of an embodiment of an optical disc playback apparatus related to this invention.

[Fig. 20]

It is an explanation view which indicates a processing rate depending on the channel number, the sampling frequency, and the quantization bit number.

[Fig. 21]

It is an explanation view which shows another example of a processing rate depending on the channel number, the sampling frequency, and the quantization bit number.

[Fig. 22]

It is a block diagram showing a main portion of a second embodiment of an optical disc playback apparatus related to this invention.

[Fig. 23]

It is a block diagram showing a playback apparatus for a DVD video disc which is a prior-art example.

[Fig. 24]

It is a block diagram showing a main portion of a playback apparatus for a DVD video disc.

[Explanation of Characters]

31-1, 31-2 audio buffer (first and second input buffer means)

32 audio decoder (forming audio data decoding means in conjunction with audio decoder buffer 33)

33 audio decoder buffer

34-1, 34-2 D/A converter (D/A converting means)

52 A-CONT decoder (forming control data decoding means in conjunction with A-CONT decoder buffer 53)

53 A-CONT decoder buffer

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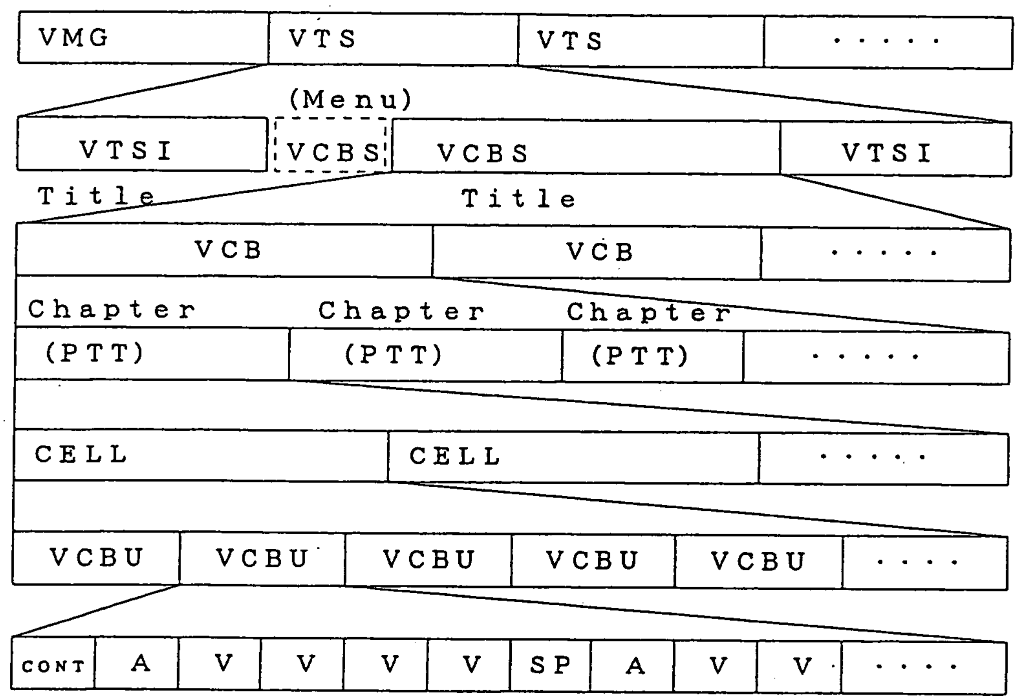
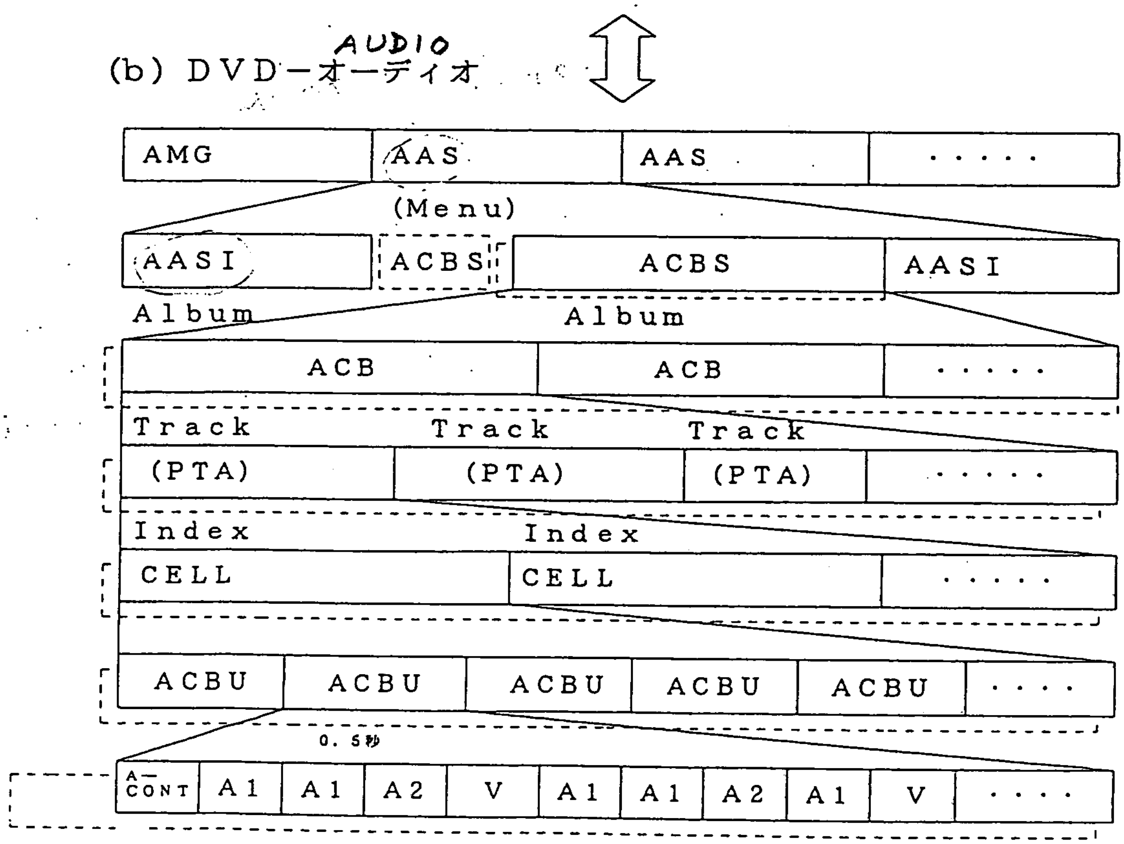
【書類名】 図面 [DOCUMENT NAME] DRAWINGS

【図1】 FIG.1

(a) DVD-ビデオ VIDEO



(b) DVD-オーディオ AUDIO



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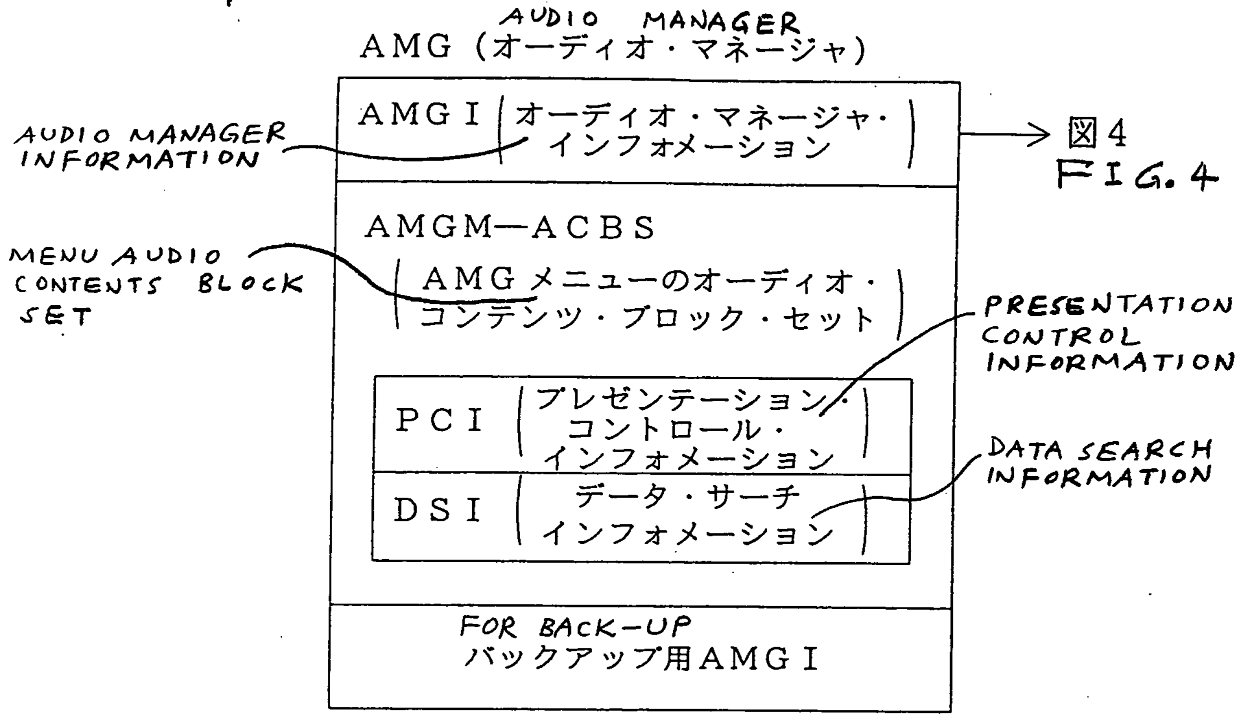
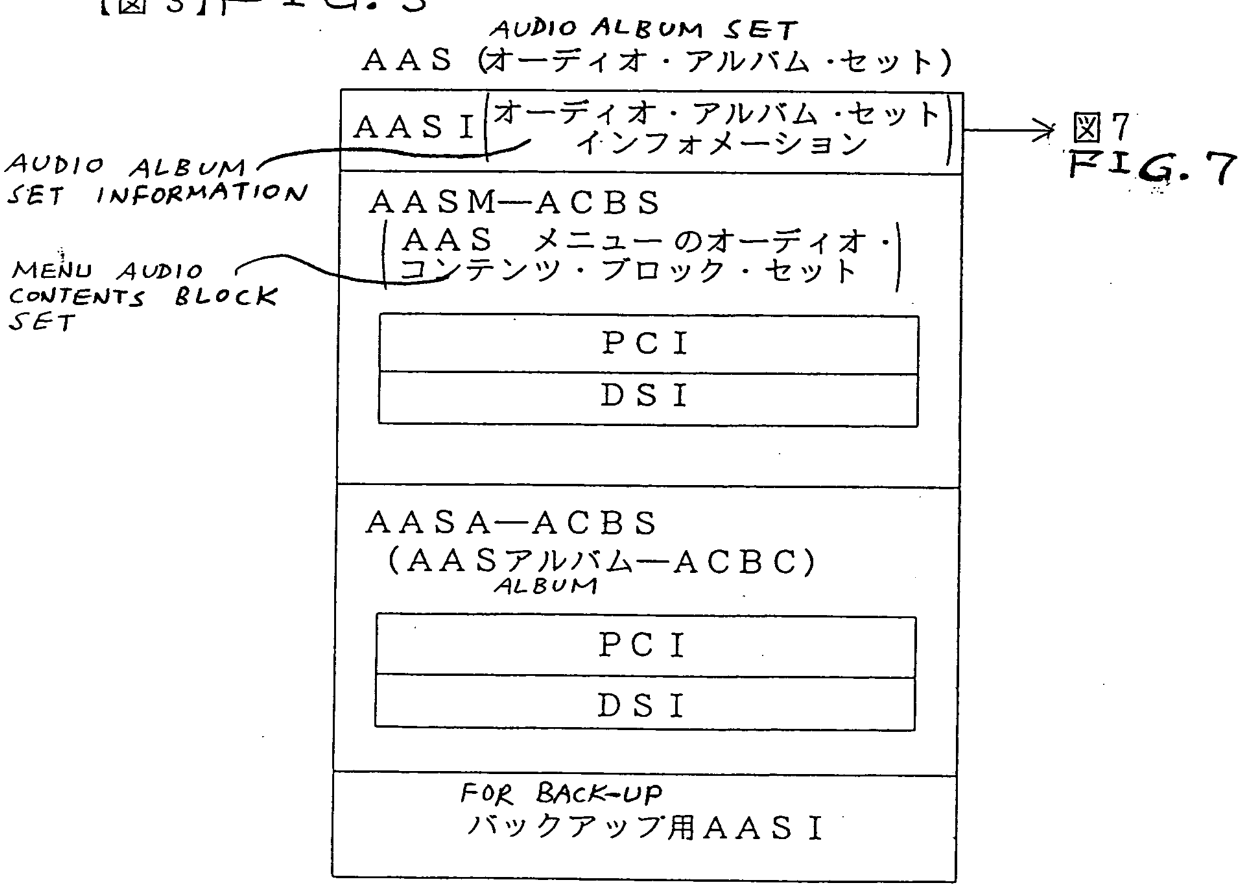
【図2】FIG. 2



【図3】FIG. 3



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【図４】FIG. 4

AUDIO MANAGER INFORMATION

AMGI（オーディオ・マネージャ インフォメーション）

AMGI—MAT（AMGI マネージメント・テーブル）	MANAGEMENT TABLE
A—SRPT（アルバム・サーチ ポインタ・テーブル）	ALBUM SEARCH POINTER TABLE
AMGM—PGCI—UT（オーディオ・マネージャ PGCI ユニット・テーブル）	AUDIO MANAGER; UNIT TABLE
PTL—MAIT（ペアレンタル・マネージメント インフォメーション・テーブル）	PARENTAL MANAGEMENT INFORMATION TABLE
AAS—ATRT（オーディオ・アルバム・セット・アトリビュート・テーブル） → 図５ FIG.5	AUDIO ALBUM SET ATTRIBUTE TABLE
TXTDT—MG（テキスト・データ・マネージャ）	TEXT DATA MANAGER
AMGM—C—ADT（AMGMセル・アドレス・テーブル）	CELL ADDRESS TABLE
AMGM—ACBU—ADMAP（AMGM—ACBU アドレスマップ）	ADDRESS MAP

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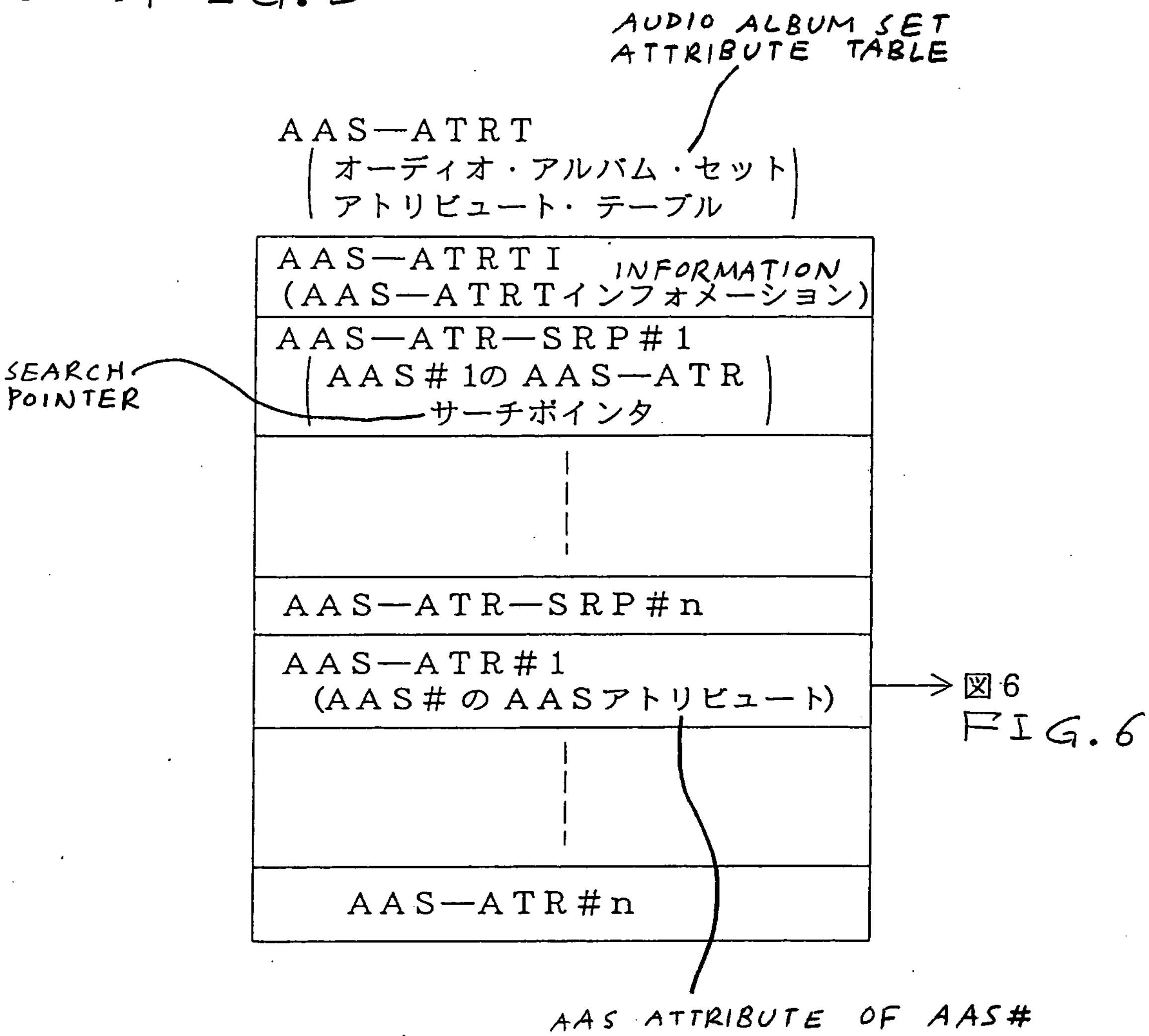
【図5】FIG.5



【図6】FIG. 6

ATTRIBUTE
ＡＡＳ—ＡＴＲ（ＡＡＳアトリビュート）

	BYTES
END ADDRESS ＡＡＳ—ＡＴＲ—ＥＡ（エンドアドレス）	４バイト
CATEGORY ＡＡＳ—ＣＡＴ（カテゴリー）	４バイト
ＡＡＳ—ＡＴＲＩ INFORMATION （ＡＡＳ—ＡＴＲインフォメーション）	７６８ バイト

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【図７】FIG. 7

AUDIO ALBUM SET INFORMATION
ＡＡＳＩ（オーディオ・アルバム・セット インフォメーション）

ＡＡＳＩ—ＭＡＴ（ＡＡＳＩ マネージメント・テーブル）
ＡＡＳ—ＰＴＡ—ＳＲＰＴ（ＡＡＳ パートオブアルバム・サーチ・ポインタ・テーブル）
ＡＡＳ—ＰＧＣＩＴ（ＡＡＳ プログラムチェーン・インフォメーション・テーブル）
ＡＡＳＭ—ＰＧＣＩ—ＵＴ（ＡＡＳメニュー・プログラムチェーン・ユニット・テーブル）
ＡＡＳ—ＴＭＡＰＴ（ＡＡＳ タイムマップテーブル）
ＡＡＳＭ—Ｃ—ＡＤＴ（ＡＡＳメニュー・セル・アドレス・テーブル）
ＡＡＳＭ—ＡＣＢＵ—ＡＤＭＡＰ（ＡＡＳメニュー・ＡＣＢＵ・アドレスマップ）
ＡＡＳ—Ｃ—ＡＤＴ（ＡＡＳセル アドレス テーブル）
ＡＡＳ—ＡＣＢＵ—ＡＤＭＡＰ（ＡＡＳ—ＡＣＢＵ アドレスマップ）

MANAGEMENT TABLE
→図８ FIG. 8
PART OF ALBUM SEARCH POINTER TABLE
PROGRAM CHAIN INFORMATION TABLE
MENU PROGRAM CHAIN UNIT TABLE
TIME MAP TABLE
MENU CELL ADDRESS TABLE
MENU
ADDRESS MAP
CELL ADDRESS TABLE
ADDRESS MAP

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【図８】FIG. 8

MANAGEMENT TABLE

ＡＡＳＩ—ＭＡＴ
（ＡＡＳＩマネージメント・テーブル）

ＡＡＳ—ＩＤ（識別子）	IDENTIFIER
ＡＡＳ—ＥＡ（エンドアドレス）	END ADDRESS
ＡＡＳＩ—ＥＡ	
ＶＥＲＮ（バージョン番号）	VERSION NUMBER
ＡＡＳ—ＣＡＴ（カテゴリー）	CATEGORY
ＡＡＳＩ—ＭＡＴ—ＥＡ	
ＡＡＳＭ—ＡＣＢＳ—ＳＡ（スタートアドレス）	START ADDRESS
ＡＡＳＡ—ＡＣＢＳ—ＳＡ	
ＡＡＳ—ＰＴＡ—ＳＲＰＴ—ＳＡ	
ＡＡＳ—ＰＧＣＩＴ—ＳＡ	
ＡＡＳＭ—ＰＧＣＩ—ＵＴ—ＳＡ	
ＡＡＳ—ＴＭＡＰ—ＳＡ	
ＡＡＳＭ—Ｃ—ＡＤＴ—ＳＡ	
ＡＡＳＭ—ＡＣＢＵ—ＡＤＭＡＰ—ＳＡ	
≈	
ＡＡＳＭ—ＡＳＴ—ＡＴＲ（ＡＡＳＭのオーディオストリーム・アトリビュート） AUDIO STREAM ATTRIBUTE	→ 図９ FIG. 9
ＡＡＳ—ＡＳＴ—Ｎｓ（ＡＡＳのオーディオストリームの数）	AUDIO STREAM NUMBER
ＡＡＳ—ＡＳＴ—ＡＴＲＴ（ＡＡＳのオーディオストリーム・アトリビュートテーブル）	→ 図１０ FIG. 10

AUDIO STREAM ATTRIBUTE TABLE

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【図9】FIG. 9

AUDIO ALBUM SET MENU
AUDIO STREAM ATTRIBUTE DATA

AASM—AST—ATR（オーディオアルバムセットメニュー・オーディオストリームアトリビュートデータ）

b63	b62	b61	b60	b59	b58	b57	b56
オーディオ符号化モード							

AUDIO ENCODING MODE

b55	b54	b53	b52	b51	b50	b49	b48
量子化／DRC		fs			オーディオチャネル数		

QUANTIZATION

AUDIO CHANNEL NUMBER

b47							b40

b39							b32

b31							b24

b23							b16

b15							b8

b7							b0

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【図１０】FIG. 10

AAS－AST－ATRT

オーディオストリーム（AST）＃０のAAS－AST－ATR	８バイト →図１１ FIG. 11
オーディオストリーム（AST）＃１のAAS－AST－ATR	８バイト
オーディオストリーム（AST）＃２のAAS－AST－ATR	８バイト
オーディオストリーム（AST）＃３のAAS－AST－ATR	８バイト
オーディオストリーム（AST）＃４のAAS－AST－ATR	８バイト
オーディオストリーム（AST）＃５のAAS－AST－ATR	８バイト
オーディオストリーム（AST）＃６のAAS－AST－ATR	８バイト
オーディオストリーム（AST）＃７のAAS－AST－ATR	８バイト

BYTES

AUDIO STREAM

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【図11】FIG.11

AUDIO ALBUM SET AUDIO STREAM ATTRIBUTE DATA

AAS—AST—ATR （オーディオアルバムセットオーディオストリーム・アトリビュートデータ）

b63	b62	b61	b60	b59	b58	b57	b56
オーディオ符号化モード			ME	オーディオタイプ		オーディオアプリケーションモード	

AUDIO ENCODING MODE　AUDIO TYPE　AUDIO APPLICATION MODE

b55	b54	b53	b52	b51	b50	b49	b48
量子化／DRC		fs			オーディオチャネル数		

QUANTIZATION　AUDIO CHANNEL NUMBER

b47	b46	b45	b44				b40
AST間引き		LFE間引き					

THINNING　THINNING

b39							b32

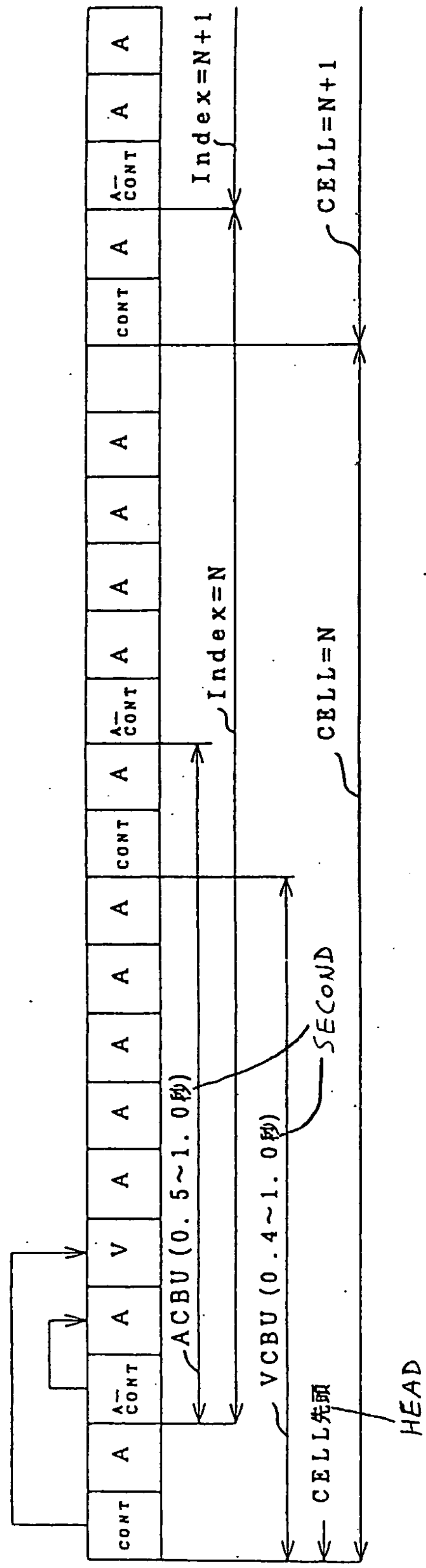
b31							b24

b23							b16

b15							b8

b7							b0

【図１２】FIG. 12


CONT
A
A-CONT
A
V
A
A
A
A
CONT
A
A-CONT
A
A
A
A
CONT
A
A-CONT
A
A
Index=N+1
CELL=N+1
Index=N
CELL=N
ACBU (0.5~1.0秒)
SECOND
VCBU (0.4~1.0秒)
SECOND
CELL先頭
HEAD

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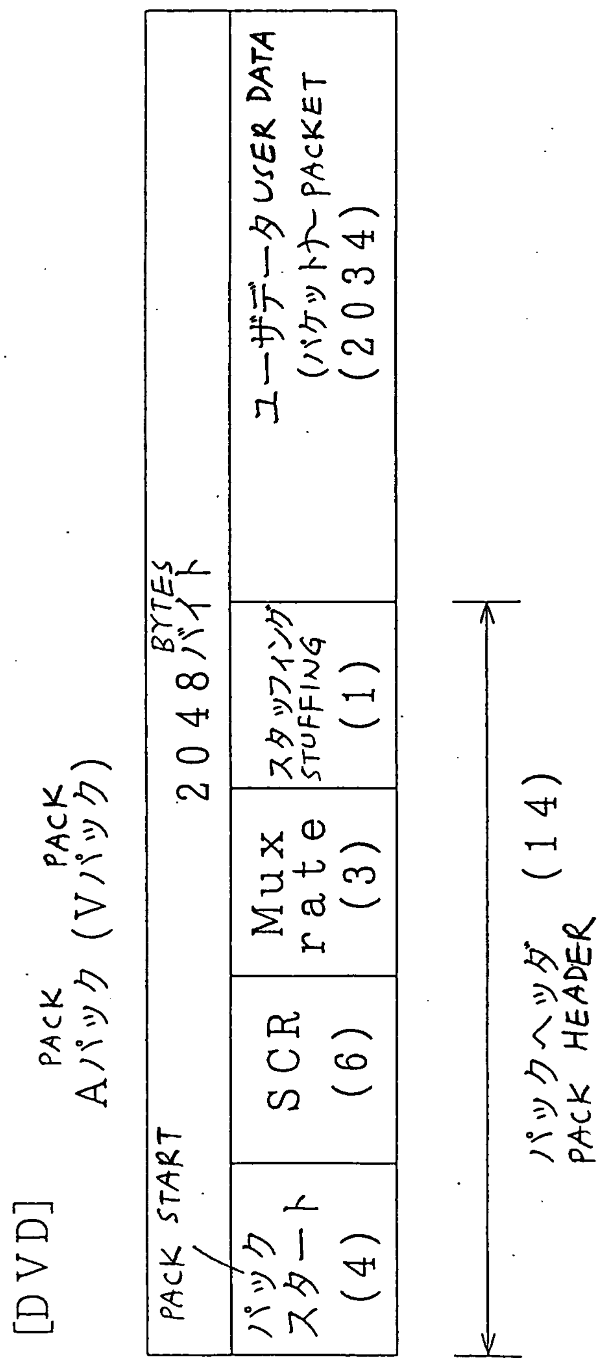
【図13】FIG. 13



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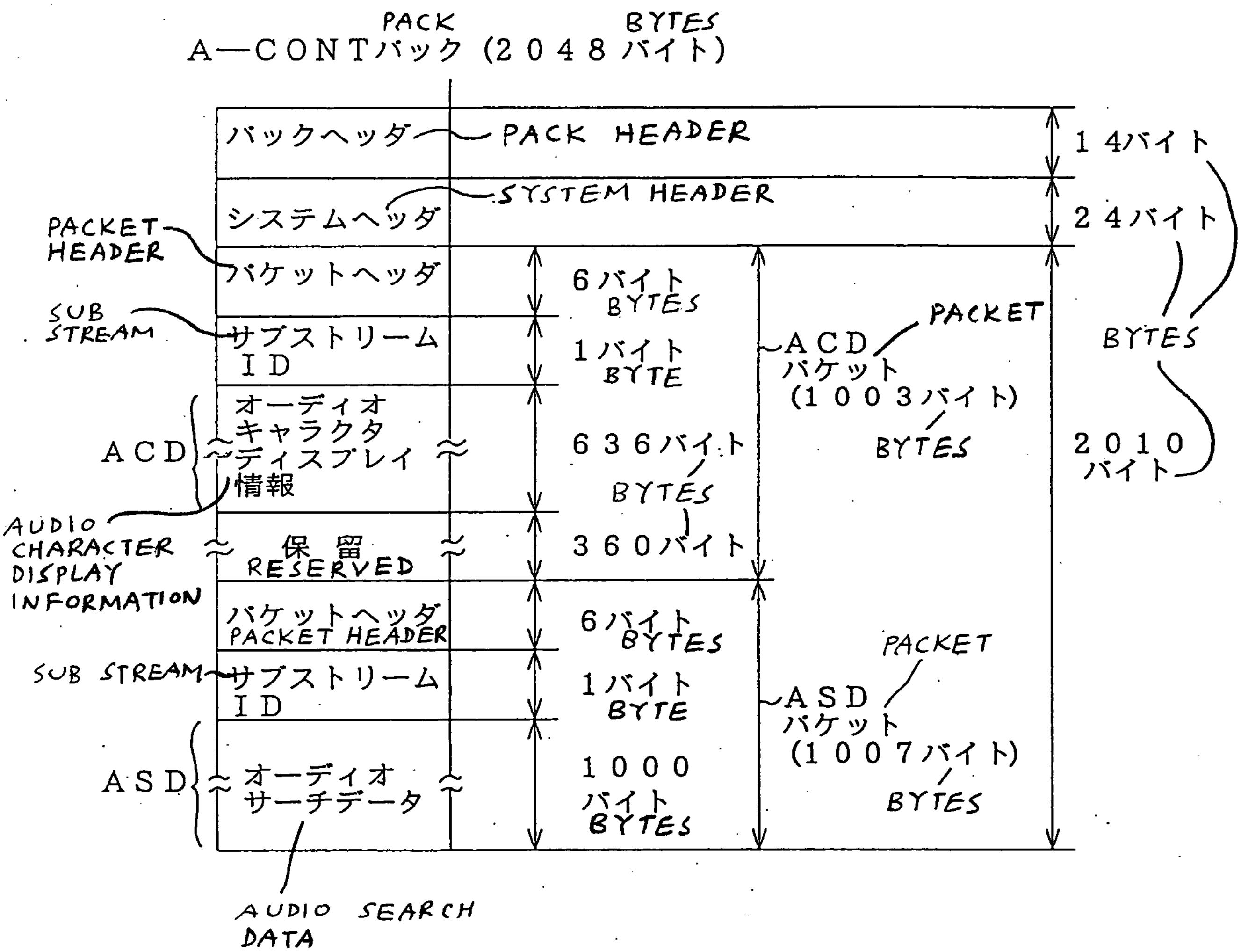
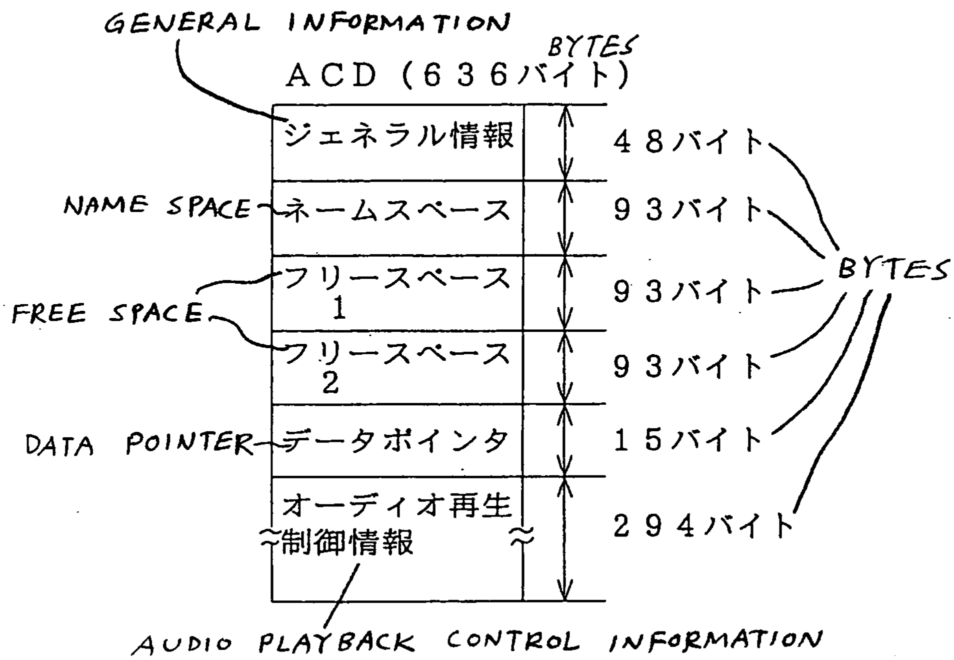
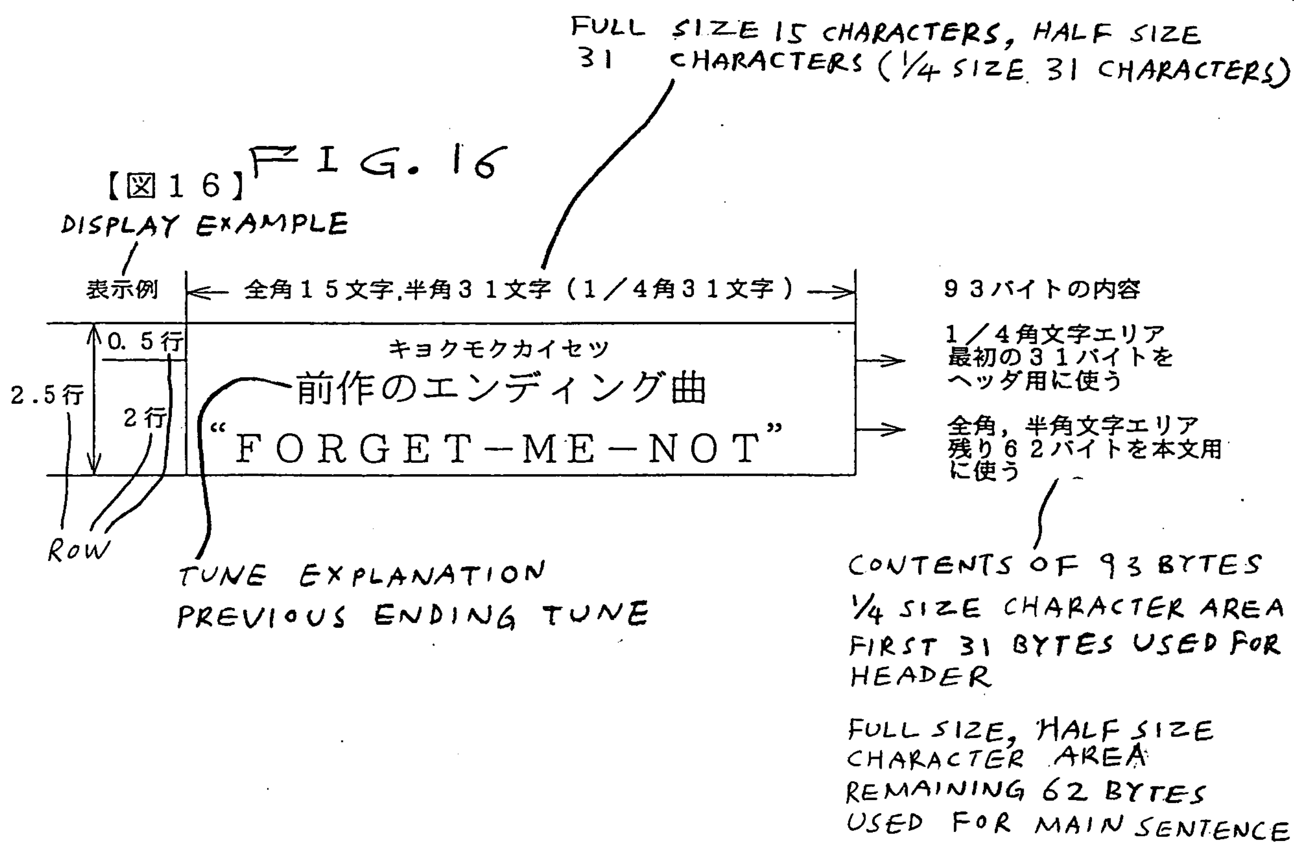
【図１４】FIG. 14



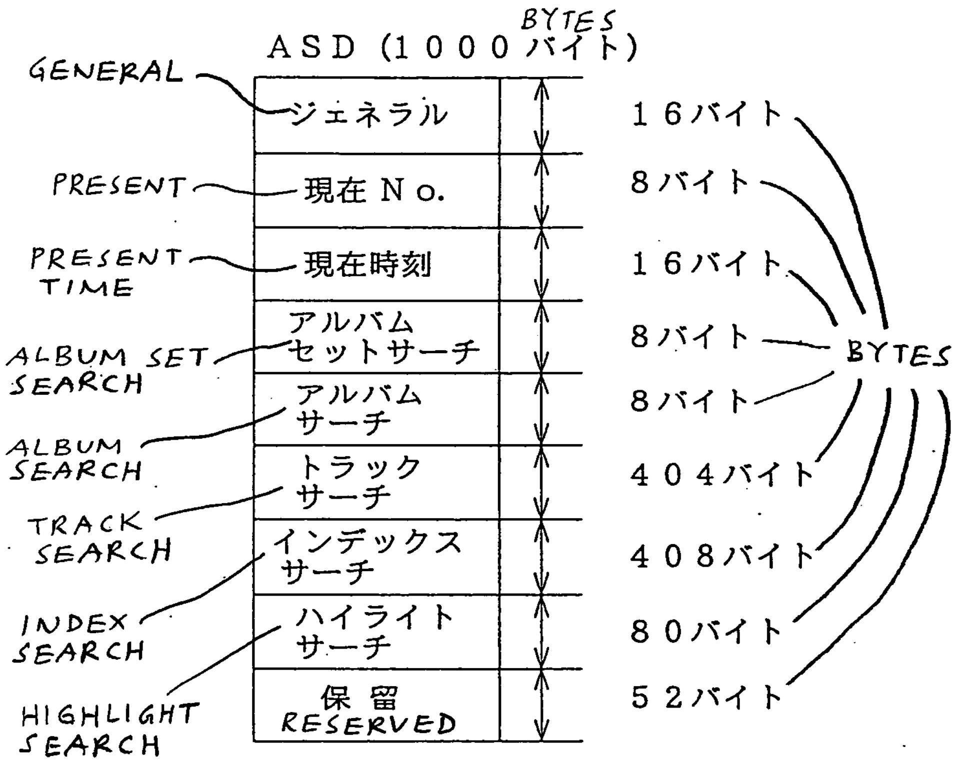
【図15】FIG.15



【図16】FIG.16



【図17】FIG. 17


BYTES
ASD（1000バイト）
GENERAL
ジェネラル
16バイト
PRESENT
現在No.
8バイト
PRESENT TIME
現在時刻
16バイト
ALBUM SET SEARCH
アルバムセットサーチ
8バイト
ALBUM SEARCH
アルバムサーチ
8バイト
TRACK SEARCH
トラックサーチ
404バイト
INDEX SEARCH
インデックスサーチ
408バイト
HIGHLIGHT SEARCH
ハイライトサーチ
80バイト
保留
RESERVED
52バイト
BYTES

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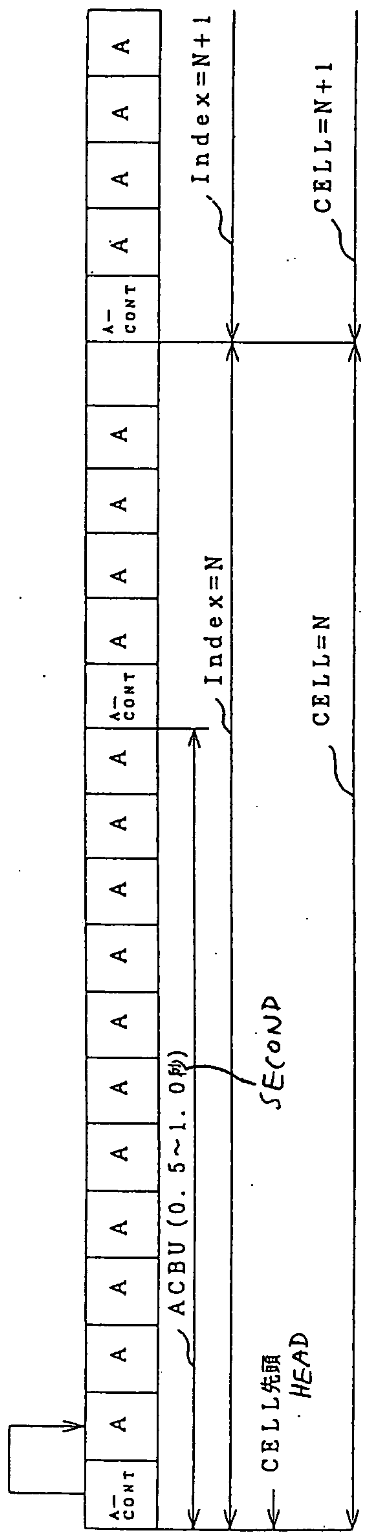
【図18】FIG. 18



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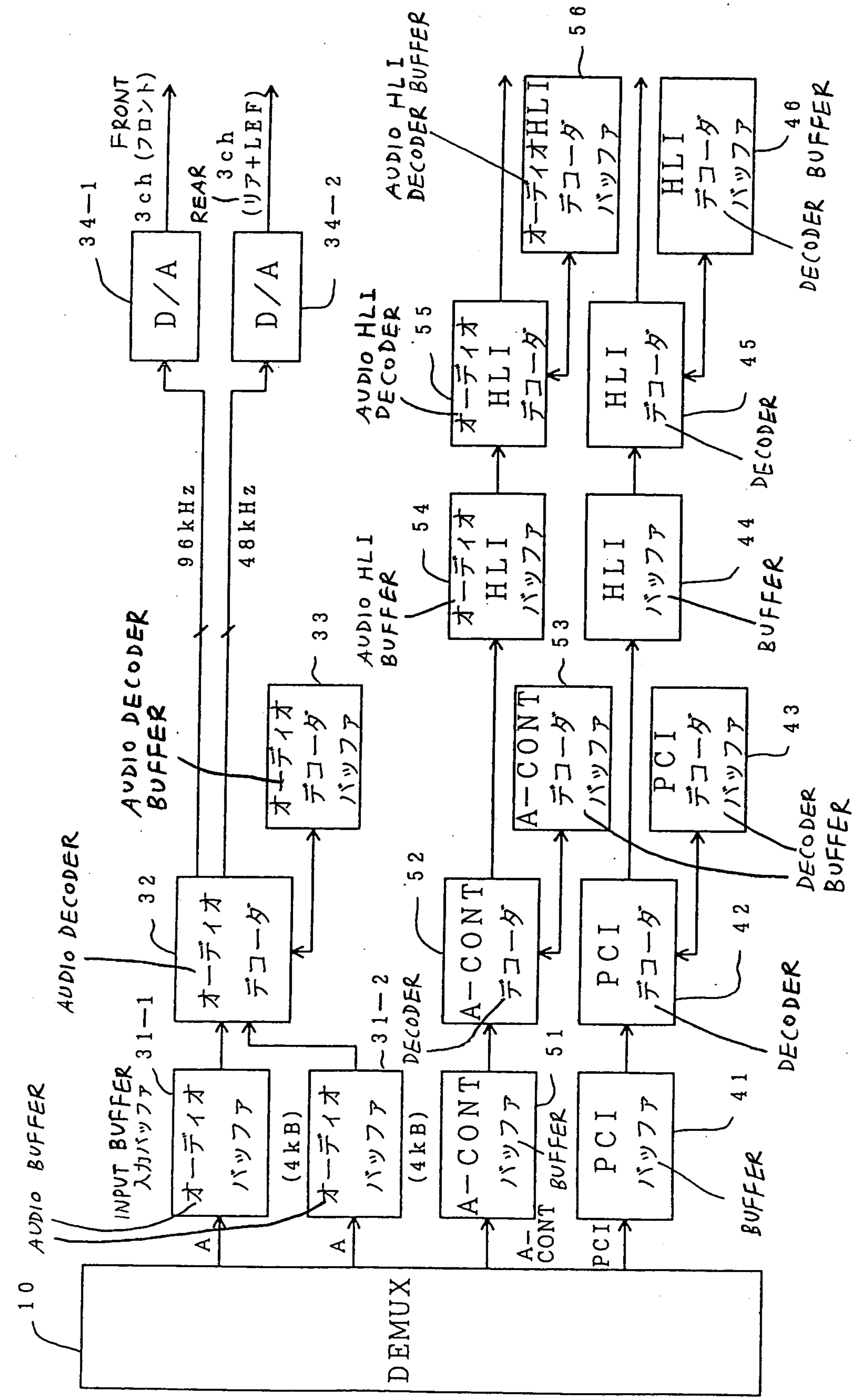
【図19】FIG. 19



【図20】FIG. 20

	2CH(stereo)	6CH	8CH	Mbps	
2ch	48khz/16bit(1.536Mbps) 48khz/20bit(1.920Mbps) 48khz/24bit(2.304Mbps)			1.536 1.920 2.304	
	96khz/16bit(3.072Mbps) 96khz/20bit(3.804Mbps) 96khz/24bit(4.608Mbps)			3.072 3.804 4.608	
	192khz/16bit(6.144Mbps) 192khz/20bit(7.680Mbps) 192khz/24bit(9.216Mbps)			6.144 7.680 9.216	× × ×
2+6ch	48khz/16bit(1.536Mbps)	48khz/16bit 48khz/20bit 48khz/24bit 96khz/16bit		4.608 5.760 6.912 9.216	 × ×
	48khz/20bit(1.920Mbps)	48khz/16bit 48khz/20bit 48khz/24bit 96khz/16bit		4.608 5.760 6.912 9.216	 × ×
	48khz/24bit(2.304Mbps)	48khz/16bit 48khz/20bit 48khz/24bit 96khz/16bit		4.608 5.760 6.912 9.216	 × ×
	96khz/16bit(3.072Mbps)	48khz/16bit 48khz/20bit 48khz/24bit 96khz/16bit		4.608 5.760 6.912 9.216	 × ×
	96khz/20bit(3.840Mbps)	48khz/16bit 48khz/20bit 48khz/24bit 96khz/16bit		4.608 5.760 6.912 9.216	 × ×
	96khz/24bit(4.608Mbps)	48khz/16bit 48khz/20bit 48khz/24bit 96khz/16bit		4.608 5.760 6.912 9.216	 × ×
2+8ch	48khz/16bit(1.536Mbps)		48khz/16bit(6.144Mbps) 48khz/20bit(7.680Mbps) 48khz/24bit	6.144 7.680 9.216	× × ×
	48khz/20bit(1.920Mbps)		48khz/16bit(6.144Mbps) 48khz/20bit(7.680Mbps) 48khz/24bit	6.144 7.680 9.216	× × ×
6ch		48khz/16bit(4.608Mbps) 48khz/20bit(5.760Mbps) 48khz/24bit(6.912Mbps) 96khz/16bit(9.216Mbps)		4.608 5.760 6.912 9.216	 × ×
8ch			48khz/16bit(6.144Mbps) 48khz/20bit(7.680Mbps) 48khz/24bit(9.216Mbps)	6.144 7.680 9.216	× × ×

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【図21】FIG.21

	2CH	FRONT 3CH	REAR 2CH, LEF 1CH	Mbps	TIME
2+6CH	48khz/16bit(1.536Mbps)	96khz/16bit(4.608Mbps)	48khz/16bit(2.304Mbps)	6.912	70
	48khz/16bit(1.536Mbps)	96khz/20bit(5.760Mbps)	48khz/16bit(2.304Mbps)	8.064	62
	48khz/20bit(1.920Mbps)	96khz/16bit(4.608Mbps)	48khz/16bit(2.304Mbps)	6.912	67
	48khz/20bit(1.920Mbps)	96khz/20bit(5.760Mbps)	48khz/16bit(2.304Mbps)	8.064	59

	2CH	FRONT 3CH	REAR 2CH	Mbps	TIME
2+5CH	48khz/16bit(1.536Mbps)	96khz/20bit(5.760Mbps)	48khz/16bit(1.536Mbps)	7.296	67
	48khz/20bit(1.920Mbps)	96khz/20bit(5.760Mbps)	48khz/16bit(1.536Mbps)	7.296	65
	48khz/20bit(1.920Mbps)	96khz/20bit(5.760Mbps)	48khz/20bit(1.920Mbps)	7.680	62
	48khz/20bit(1.920Mbps)	96khz/24bit(6.912Mbps)	48khz/16bit(1.536Mbps)	8,448	57

		FRONT 3CH	REAR 2CH, LEF 1CH	Mbps	TIME
6CH		96khz/16bit(4.608Mbps)	48khz/16bit(2.304Mbps)	6.912	86
		96khz/20bit(5.760Mbps)	48khz/16bit(2.304Mbps)	8.064	74
			48khz/20bit(2.880Mbps)	8.64	68
			48khz/24bit(3.456Mbps)	9.216	65
		96khz/24bit(6.912Mbps)	48khz/16bit(2.304Mbps)	9.216	65

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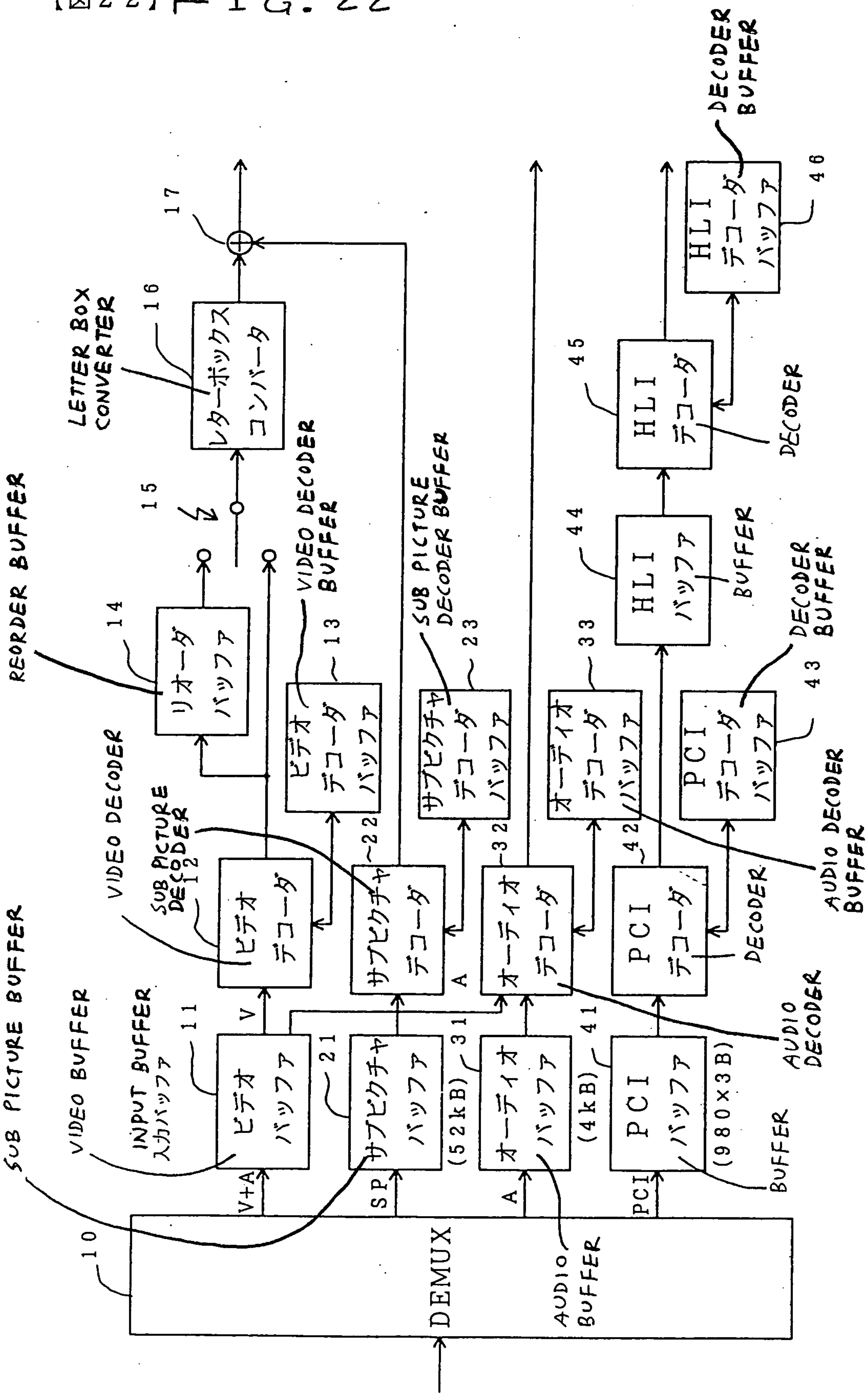
【図22】FIG. 22



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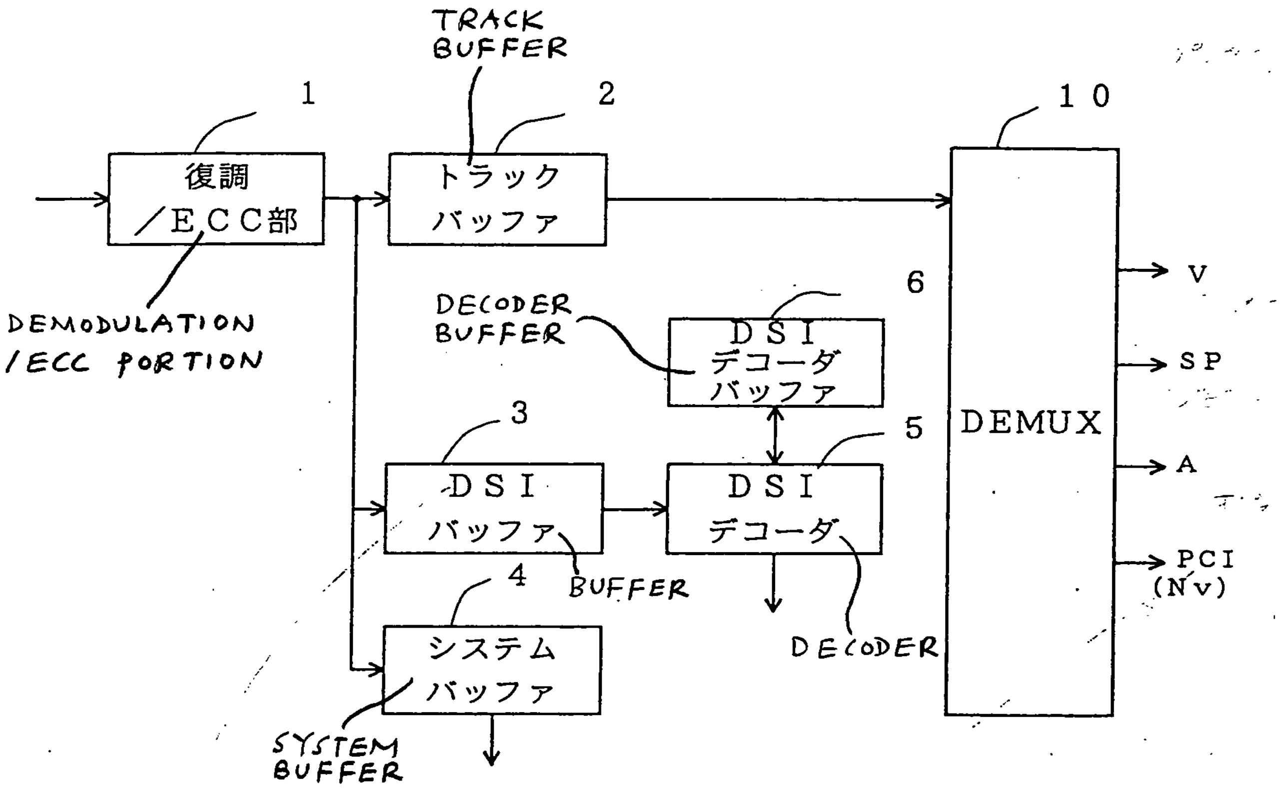
【図23】FIG. 23



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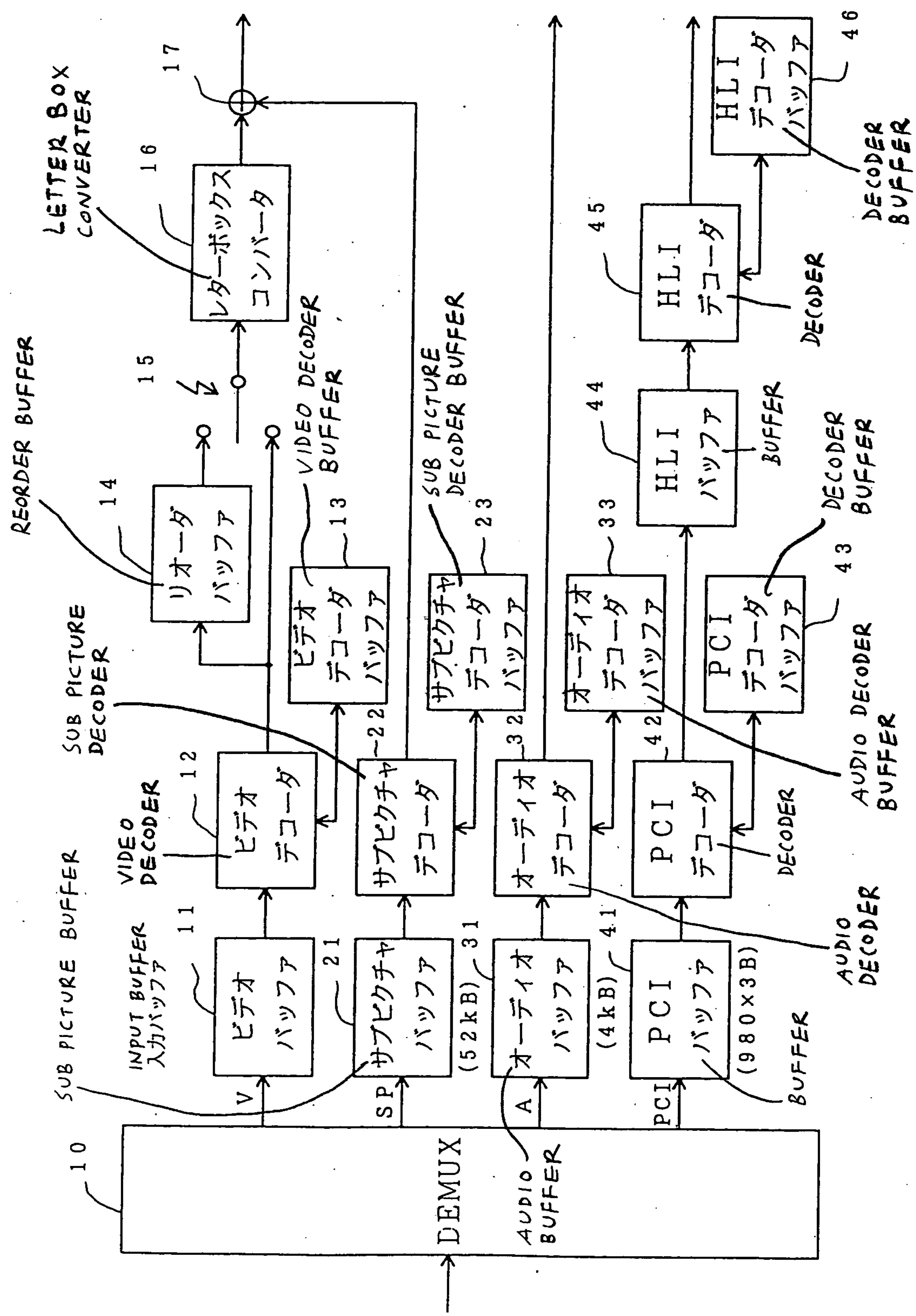
【図24】 FIG. 24



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[DOCUMENT NAME] Abstract

[ABSTRACT]

[Task] It is to make processing possible even in the case where an audio signal is recorded with a greater channel number, a higher sampling frequency, and a greater quantization bit number than those in the DVD video standards.

[Solving Means]

Audio buffers 31-1 and 31-2, an A-CONT buffer 51, and a PCI buffer 41 are provided as input buffers for buffering A packs, A-CONT packs, and PCI respectively. The capacitance of each of the audio buffers 31-1 and 31-2 is 4 k bytes. An audio decoder 32 and an audio decoder buffer 33 decode an audio stream signal (= user data) in the A packs alternately buffered by the audio buffers 31-1 and 31-2 into audio PCM signals on the basis of information in the A-CONT pack decoded by an A-CONT decoder 52.

[Selected Drawing] Fig. 19

【Document Name】 Office Correction Data

【Corrected Document】 Patent Application

<Recognized Information・Additional Information>

【Applicant(s)】

【Identification Number】 000004329

【Address or Abode】 3-12, Moriya-cho, Kanagawa-ku, Yokohama-shi, Kanagawa-ken

【Name or Designation】 Victor Company of Japan, Ltd.

【Agent】 Petitioner

【Identification Number】 100093067

【Address or Abode】 Nihei Kokusai Tokkyo Jimusho, 3rd Floor, Izumi Bldg., 2-4-1, Shiba Daimon, Minato-ku, Tokyo

【Name or Designation】 Masayuki NIHEI

APPLICANT'S PERSONAL HISTORY INFORMATION

Identification Number [000004329]

1. Date of Change August 8, 1990

   [Reason for Change] For New Registration

   Address: 3-12, Moriya-cho, Kanagawa-ku, Yokohama-shi, Kanagawa-ken

   Name: Victor Company of Japan, Ltd.